ABSTRACT

This research aims to design and implement an automated room conditioning system capable of improving air quality, regulating temperature, and maintaining humidity in enclosed spaces. The system was developed as a solution to indoor air pollution problems that can negatively impact the health and comfort of occupants. The system design includes the selection of optimal sensors, actuators, and hardware components, such as the DHT22 sensor for measuring temperature and humidity, the SDS011 particulate matter sensor, and a Raspberry Pi as the main processing unit.

The system is equipped with a control logic that can automatically operate the *humidifier*, *dehumidifier*, HEPA air filter, and Air conditioning unit according to environmental conditions. It is designed to maintain room temperature within the range of 20–27 °C, humidity between 40–60%, and PM2.5 particulate levels below 35 µg/m³. This study has gone through the stages of requirement analysis, workflow design, sensor calibration, and comprehensive system performance testing.

The test results show that the system is capable of responding to changes in environmental conditions quickly and accurately, and it successfully maintains environmental parameters in accordance with comfort and health standards. Therefore, this system has great potential to be applied in various types of rooms, including homes, offices, and laboratories, to support occupant health and productivity.

***Keywords**: Automated room conditioning, air quality, temperature, humidity, air filter, raspberry pi*